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REMARKS

Claims 11 and 13-30 are pending in this application.

**General Considerations**

An embodiment of the claimed device is intended for purifying water (e.g., for drinking water) in underdeveloped countries or in regions where clean drinking water is not available. The handling of the device should be very simple so that it can be operated without sophisticated technical training. One embodiment of the device requires only a small amount of power, so that it can be operated by solar power, rather than electric or mechanical power. Another embodiment uses a small gas burner, e.g., a camping burner, as a heating source. The device is desirably very compact, in one embodiment having a diameter of about 20 cm (without a power supply). One needs only to supply a reservoir of water to be purified, a tube for connecting the reservoir to the device, and a second reservoir for collecting the purified water. The device also operates relatively quickly for such a small device. One embodiment of the invention can produce about ten liters of pure drinking water in about eight hours.

**Response to Rejections**

Claim 11 recites a device for thermal sterilization of liquids comprising:

a counterflow heat exchanger including a conduit with a heating section and a cooling section in fluid connection with one another,

a heating source for heating the liquid,

the heating section and the cooling section being spirally arranged around the heating source,

the heating source being generally located in the center of the spiral,

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said conduit being constructed of flexible material,  
individual windings of conduit lying one on the other and  
contacting each other, and

a check valve for allowing liquid flow only in a direction  
from the heating section to the cooling section.

Claim 11 stands rejected under 35 U.S.C. § 103(a) as unpatentable over US 6,623,603 (Call) in view of US 6,402,897 (Gunn) and further in view of US 4,411,310 (Perry). As explained below, Call was not properly applied in the rejection because only portions of the Call patent are prior art to the present invention. As properly applied, most of the features of the invention are not shown by Call, so that the reference is no longer relevant. As also explained below, there is no suggestion or motivation to combine Call with Gunn and with Perry as asserted by the Examiner.

Importantly, portions of the Call patent are not prior art under 35 U.S.C. 102(e) because those portions are not supported by the provisional application upon which Call is based. The Call non-provisional application was filed after the international filing date (the effective filing date under 35 U.S.C. 365(c)) of the present application. Under MPEP 2136.03, the filing date of the Call provisional application can only be used if the provisional properly supports the subject matter relied upon to make the rejection. Portions of the Call patent that are not supported by the provisional are not prior art to the present invention because the Call non-provisional application was filed after the international filing date of the present application. The Call non-provisional application was filed October 19, 1999, while the international filing date of the present application is September 14, 1999.

The Call provisional application differs from the Call patent in many respects. In particular, the Call provisional

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application does not show the embodiments of Figs. 11-16 of the Call patent. Also, Figs. 6-7 of the provisional are not included in the Call patent.

The present application differs from the Call provisional application in that the following features are not shown:

- 1) the heating section and the cooling section spirally arranged around the heating source,
- 2) the heating source generally located in the center of the spiral,
- 3) the conduit constructed of flexible material,
- 4) individual windings of conduit lying one on the other and contacting each other, and
- 5) a check valve for allowing liquid flow only in a direction from the heating section to the cooling section.

Thus, the majority of the features claimed in claim 1 are not shown by Call, as properly applied under 102(e).

Accordingly, Call is not relevant to the claimed invention.

Even assuming that Call is relevant, there is no suggestion or motivation to combine it with various features of Gunn and Perry as asserted in the rejection. In order to maintain a § 103 rejection, the Examiner must present a convincing line of reasoning why an ordinarily skilled artisan would have found the claimed invention to have been obvious. Ex parte Clapp, 227 U.S.P.Q. 972 (BPAI 1985). No such reasoning has been presented in this case.

In an embodiment of the present invention, the liquid (water) is heated to very high temperatures up to 150°C by the heating device. The high temperatures will cause superheated steam to be produced in the center of the spiral arrangement, thereby dramatically increasing the pressure. When the high pressure is greater than the water pressure from the supply, the high pressure will act as a pump to cause a backflow. Therefore, the claimed device includes an additional element for preventing

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a backflow against the supply. As amended, claim 11 requires a check valve for preventing this backflow.

In addition, the gas pressure of the superheated steam is not constant but is varying within a large range. Because of this variance, pressure waves are produced. If one uses only a pump as taught by Call, these pressure waves can reach the outlet of the pump, and can even destroy the pump. The check valve of the present invention blocks the pressure waves and inhibits them from reaching the outlet.

Gunn discloses a distillation unit performing the functions of a distillation unit and a water heater (column 3, line 53). Impure feed water from feed pipe 9 flows through a first heat exchanger (called "distilled water cooler 35"), then via feed pipe 9 through a "concentrate heat exchanger 23", then via line 9d through another heat exchanger 9e, and finally into a distillation unit 5. Within this distillation unit the feed water is separated into two components, 1) distilled steam and 2) concentrate.

The Gunn device comprises three different heat exchangers, namely:

- 1) A cold distilled water cooler 35 which preheats the feed water from line 9a for cold water preparation.
- 2) A concentrate heat exchanger where the feed water from line 9 is further preheated by concentrate from the distillation unit.
- 3) The coiled section 9e immersed into the water of the tank 3 wherein the preheated feed water from the concentrate heat exchanger 23 is thermally coupled with the distilled water within tank 3.

However, the purpose of these three heat exchangers is not to purify the water. The gist of the Gunn device is the distillation unit 5, wherein the feed water is separated into distilled steam and concentrate. Gunn has at least one inlet

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(9a) for feed water and at least two outlets: one outlet for distilled water (21 and/or 31) and another outlet for concentrate (13c).

In contrast, the present invention does not use a distillation unit. The device of the invention has only one inlet and only one outlet and is designed to provide relatively cold water. The invention does not separate the feed water into two components. All feed water is drawn out from the device via one single exit. The invention does not use a distillation process but only heats the feed water to a high temperature where all bacteria, viruses, etc. are destroyed. The heating is done in the middle of the heat exchanger. The steam or hot water from the middle of the heat exchanger is used to preheat the incoming feed water.

The feed water of the present invention is preheated in the heating section of the counter-flow heat exchanger. Then it is heated by a heating source to very high temperatures which will cause super-heated steam to be produced in the center of the spiral arrangement, thereby dramatically increasing the pressure. When the high pressure is greater than the water pressure from the feed supply, the high pressure will act as a pump. The check valve is advantageous because it prevents a back flow against the supply. As gas bubbles are produced one after the other, there is some oscillation of the pressure, and pressure waves are thereby created. During the time period where the check valve is closed, no additional feed water is charged into the unit, and only hot water is discharged through the second part of the heat exchanger (the cooling section). Therefore, the check valve of the present invention not only prevents a back flow, but also has serves another purpose: to form a kind of pump in connection with gas bubbles produced by the heating section. In addition, the check valve provides for a stable pressure within the heating section, if it is in its closed position.

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The check valves 29, 132, 232 (col. 6, lines 40-43; col. 12, lines 5-9, col. 15, lines 20-24) of Gunn are only for controlling the flow of concentrate out of the distillation unit and to prevent backflow of concentrate. In contrast, the check valve of the invention has the further purposes of:

- 1) blocking pressure waves of gas bubbles of superheated steam from escaping through the inlet of the device, and
- 2) in combination with the flexible conduit, aiding the below-mentioned "peristaltic motion", which drives the water flow in the desired direction.

It should be clear that the check valve of the present invention has a different purpose and a different function and therefore, it is improper to substitute the check valve of Gunn for the check valve of the claimed invention. Also, neither Call nor Gunn suggest addition of a check valve to the device of Call. Moreover, neither reference suggests such an addition for the above purposes, which provide an advantage in combination with the other claimed elements of the invention.

Claim 11 is further patentable over the references because it recites that the conduit is constructed of flexible material. Call and Gunn do not show or suggest a conduit constructed of flexible material. The Examiner asserts that Perry shows flexible material. However, the Examiner fails to show some motivation or suggestion for the purported combination.

Perry shows a heat exchange apparatus made up of a plurality of thin flexible sheets bonded to one another. The main purpose of this device is to reduce the costs of the entire system in comparison with metal as material for the heat exchange elements (column 2, lines 21-25).

In contrast, the flexible material of the heat exchanger of the claimed invention is used to allow "peristaltic motion" caused by the pressure waves mentioned above. The "peristaltic motion" promotes additional transport of the water, in

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combination with the check valve at the inlet, producing a pulsing water flow through the heat exchanger with phases of higher and lower flow velocity. Because of this "pump effect" of the conduit, the device operates even with very minimal water pressure at the heat exchanger inlet (comp. page 5, first paragraph of the English translation of the application). Therefore, the flexible material of the present invention supports the pump function of the gas bubbles and the check valve for discharging purified water from the cooling section. As should be clear, the flexible material of the present invention is used for a different purpose than Perry.

Regarding combining elements found in the prior art, the Federal Circuit has stated: "Most if not all inventions arise from a combination of old elements. See *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998). Thus, every element of a claimed invention may often be found in the prior art. See *id.* However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. See *id.* Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant." *In re Kotzab*, 217 F. 3d. 1365, 1369-1370 (Fed. Cir. 2000). Emphasis added. "Further, a rejection cannot be predicated on the mere identification...of individual components of claimed limitations. Rather, particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed." *Id.* at 1371. Emphasis added.

As can be seen, the synergistic combination of features of claim 11, including the flexible conduit, the spiral arrangement and the check valve, work together in a new device that is a

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significant improvement over the prior art. The claimed device is desirably compact, easy to operate, and operates with relatively little power. This synergistic combination of features is clearly not shown or suggested by Call, Gunn, Perry or the other art of record. Accordingly, claim 11 is allowable.

Claims 13-21 depend directly or indirectly from claim 11 and are submitted as patentable for the same reasons.

Claim 22 is directed to a thermal sterilizer for liquids comprising:

a counterflow heat exchanger including a conduit with a heating section and a cooling section in fluid connection with one another,

a heating source for heating the liquid,

the heating section and the cooling section being spirally arranged around the heating source,

said conduit being constructed of flexible material.

To the extent claim 22 recites the same subject matter as claim 11, it is submitted as patentable for the same reasons.

Claims 23-30 depend directly or indirectly from claim 22 and are submitted as patentable for the same reasons.

Claims 15-16 and 24-25 and recite that the conduit comprises elastic films. The rejection combines portions of Call, Gunn, Perry and a fourth reference, Hakim-Elahi, which "teaches the use of elastic materials in the art of designing heat exchangers." Applicants agree that elastic materials have been used before in heat exchangers. However, the rejection again fails to state a convincing line of reasoning why one of ordinary skill would have pieced together the disparate elements of four references. It is clear the Examiner is using hindsight to piece the claimed invention together from the four references. Accordingly, claims

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15-16 and 24-25 are submitted as patentable for this additional reason.

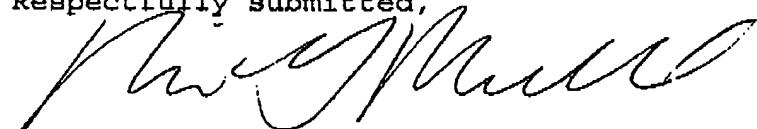
Similarly, the Examiner pieces together portions of Call, Gunn, Perry and Suchomel to reject claims 17-19 and 26-28. The Examiner relies on "design choice" as the motivation for the combination. Mere assertions that it is well within the ordinary skill of the art or an obvious matter of design choice are insufficient to make out a *prima facie* case of obviousness. Ex parte Levengood, 28 U.S.P.Q.2d 1300, 1301 (BPAI 1993). Therefore, claims 17-19 are patentable for this additional reason.

CONCLUSION

In view of the foregoing, allowance of the application is respectfully required. The undersigned requests a telephone interview with the Examiner if the application is not allowed following review of this paper.

Applicant does not believe that a fee is due in connection with this response. If, however, the Commissioner determines that a fee is due, he is authorized to charge Deposit Account No. 19-1345.

Respectfully submitted,



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